GOVERNMENT OF NEWFOUNDLAND AND LABRADOR

Highway Planning and Research
Department of Transportation
St. John's, Newfoundland

DEPARTMENT OF TRANSPORTATION

RESEARCH REPORT NO. 18

EVALUATION OF DURA-BRITE SNOWPLOWABLE REFLECTIVE PAVEMENT MARKER

Catherine Perry
Planning and Research
September, 1982

TABLE OF CONTENTS

Summary and Recommendations

Introduction

Description of Dura-brite

Evaluation of Dura-brite

(a) Field Study Under Newfoundland Conditions

(b) Cost Evaluation of Dura-brite

(c) Installation Instruction

Recommendation

Bibliography

Appendix A: Pre-Qualification Procedures

SUMMARY AND RECOMMENDATIONS

The fact that unfavourable weather often limits the driving ability of motorists on Newfoundland highways indicates the need for plowable raised reflective pavement markers that are both durable and visible under all weather conditions. In an attempt to identify markers that can meet these requirements, the Department of Transportation has designed a test-program to sample submitted markers. To date, the Stimsonite 96 has passed the pre-qualification criteria, and is invited to submit tender.

This study examines a Durastone model, Dura-brite, and its results in the Newfoundland field study. The conclusion reached is that Dura-brite has performed well, rating highly in both durability and visibility. In addition, the marker caused no noticeable damage to snowplow blades.

Based on the findings of this report, it is recommended that Dura-brite be deemed effective, as outlined by the pre-qualification guidelines, and that its manufacturer, Durastone, be invited to tender should the Department commence a program requiring the use of raised reflective pavement markers.

INTRODUCTION

Plowable raised reflectorized pavement markers are used to serve two purposes. First, in adverse weather conditions, the markers heighten the ability of motorists to see pavement markings. Second, recent research indicates the effectiveness of such markers in supplementing the regular line striping under clear conditions.

Currently, the Stimsonite 96 and the Kingray models have undergone testing on Newfoundland highways. The Stimsonite marker, based on its performance, has passed the pre-qualification requirements as set by the Department of Transportation. This study uses the pre-qualification guidelines to evaluate the Dura-brite reflective marker. The specific objectives are:

(i) to evaluate the ability of Dura-brite to withstand and perform under Newfoundland weather conditions

(ii) to present a summary of the cost of the marker

The resulting evaluation will form the basis of recommendation concerning Durastone's invitation to tender.

DESCRIPTION OF DURA-BRITE

Dura-brite is a raised reflective marker which, by its design, protects itself from snowplow blades. The marker is recessed in its base and consequently, the plow rides up and over the lens without damaging the unit. An additional characteristic is the model's capacity to withstand the impact of tungsten carbide blades, a weakness evident in some competitive systems. Dura-brite has two-directional plowing ability.

Test results, compiled by personnel in the Department of Transportation of Rhode Island, support the product's claims of superior visibility and durability. Dry pavement tests indicate that the marker retains its reflectivity and shows little wear after repeated snowplowing.

EVALUATION OF DURA-BRITE

Three factors need examination in evaluating Dura-brite's usefulness to the Department. These considerations will be addressed in this section.

A. Field Study Under Newfoundland Conditions

The markers were tested under Newfoundland weather conditions. Evaluation procedures followed the pre-qualification guidelines, as seen in Appendix A. Documentation of the analysis of the field study is as follows:

Description

During July and August, 1981, the Department of Transportation installed Dura-brite raised reflective markers. The first fifteen placed were done by Highways, with supervision by representatives of Durastone. Twenty more were installed without input from the company. The site of the markers is Doe Hills, a curving section of highway on the Avalon Peninsula. All reflectors in this area are Dura-brite.

Observations

The markers have been observed throughout the winter on a continuous basis. Comments were obtained from Mr. Clem Temple, highway foreman, who has been involved with the markers since the installation date. Other observations have been recorded from Jeanette Power, Jim Andrews, and Steve Bugden.

Results

The evaluation has been based on three criteria: reflectivity, durability, and effect on snowplow blades. The results are favourable for Dura-brite as given in the following description:

A. Reflectivity

The highway foreman for the tested area comments that the marker is reflecting well during heavy fog and snow and is also visible in good daytime conditions. Overall, the marker is seen as an aid to motorists in Doe Hills.

B. Durability

Some of the reflective faces on the markers have suffered cracking and chipping. This damage however does not appear to impair performance of the system. It is believed that the damage seen is due to the setting used when the units were initially installed. Those coordinated by the Department have worn slightly, but are in much better condition than the reflectors installed under the supervision of the company. A conflicting observation states that some have been positioned too low, resulting in a loss of visibility. This problem is a consequence of the lack of experience in placing the marker, and will likely be rectified as further installation occurs. The bases of the models show no significant wear.

Snowplow blades have not been damaged by the raised markers.

These observations are supported by research conducted in the United States. "Dry plow" tests indicate the marker's ability to resist damage from repeated snowplowing. In addition, Dura-brite's performance in

unfavourable weather has attracted the attention of the industry.

An important consideration that warrants statement here has been recognized by Highways. It is thought that some of the cracking and chipping is due to the method of snowplowing in the Doe Hills region. The plow removes snow across the roadway, rather than in the conventional way. Hence, it is likely that damage results from the chains on the tires of the plows which can fit between the raised protective parts of the marker. A revision of this method may result in lower maintenance costs in the future.

To summarize the following observations are relevant:

(a) Most units have functioned well throughout the winter and are not severly damaged. Dirt build-up is not apparent.

(b) The model was seen as an asset to driving in the area, and was bright in inclement conditions.

(c) Snowplow blades were not damaged from clearing the roadway.

These factors lead to a conclusion that Dura-brite is effective under Newfoundland weather conditions.

B. Cost Evaluation of Dura-brite

Due to the difficulty in determining actual prices, this analysis will use estimates made by the Department when installing the marker at Doe Hills. It should be noted here that a comparison of costs between markers may be misleading. A marker with a low initial cost may, over a period of time, require greater cash outlay than a marker with a higher initial price, due to costs attributed to maintenance. Therefore, the overall evaluation is to be based on performance with cost as a pertinent, but not the critical concern.

The unit cost of Dura-brite is twenty dollars. However, this cost is tentative and may change depending on the volume of the product sold this year. SET 45, the adhesive used, is independently sold, and prices will fluctuate with quantity bought. Since the applicable costs are vague, further analysis in needed prior to a full-scale purchase.

C. Installation Instruction

Installation of Dura-brite follows four steps. First, the pavement is cut to a preset depth, using a specially set-up milling machine which is available to the Department. Second, the pavement groove is cleaned and partially filled with SET 45, the cement recommended by Durastone. Third, the marker is placed in the groove and pressed into place. Measurements ensure that the proper depth and seating have been realized. Finally, any excess adhesive is removed.

The use of SET 45 allows roads to be reopened in forty-five minutes. Further, with one drilling machine, a team of eight men can install eight-hundred markers in an eight hour day under standards of equipment and marker-spacing experienced in Rhode Island.

Actual installation experiences in Newfoundland, as reported by the highway foreman, have found that the process is relatively easy. One major difficulty that has been identified concerns cutting the pavement to the correct depth. Some markers have been set too low, while others are too high. It is likely that successful installation will result from experience. Estimated labour cost per unit installed, given Newfoundland spacing requirements and equipment availability, is twenty dollars.

RECOMMENDATION

The recommendation that Durastone be invited to tender should the Department commence a progrm requiring raised reflective pavement markers is based mainly on the results of the field study, with cost considerations and installation procedures being presented as important criteria. The following observations have been made:

(a) The unit has been proven durable. The winter of plowing has resulted in little significant damage.

(b) Installation procedures are easy and quick.

(c) The marker increases visibility in adverse weather.

(d) No damage has been suffered by snowplow blades.

These factors indicate that Dura-brite is suitable to serve the requirements of the Department of Transportation.

BIBLIOGRAPHY

Acknowledgements:

Mason, Jim
Regional Representative for Durastone, Halifax.

Temple, Clem
Highway Foreman, District I
Department of Transportation

Warren, Les
Department of Transportation, Clarenville

Report:

Power, J.M., Evaluation of Snowplowable Raised Reflective Pavement Markers, Newfoundland Department of Transportation, June, 1981.

APPENDIX A

PRE-QUALIFICATION PROCEDURES

Road Service Life Tests

The samples of plowable raised reflective pavement markers will be tested under the following conditions:

(i) The markers will be tested from the fall of the year through the winter season so that observations may be made under various weather conditions.

(ii) The markers will be tested in an area which is subject to snowplow activity.

(iii) The markers will be placed in an area with a minimum AADT of 2,000.

(iv) The markers will be tested in the median of a two lane highway to test their durability under bi-directional traffic flow and snowplowing.

(v) The markers will be placed on a curve to test their visibility.

The general appearance, durability, and visibility test will be conducted on all samples.

RESEARCH REPORTS

1.	Highway Pavement Markings	79 01
2.	Studded Tires	79 08
3.	Longitudinal Pavement Markings	79 10
4.	Results Seat Belt Survey	80 01
5.	Evaluation of Non-Coning Traffic Paint	80 02
6.	Salt Spreading Techniques	80 04
7.	Extra Provincial Truck Licencing Revenues	80 11
8.	A Discussion on the Methodoloty to Determine Environmental Guidelines for Highway Construction	80 12
9.	Evaluation of Snowplowable Raised Reflective Pavement Markers	81 06
10.	Results Seat Belt Survey 1981 06 17	81 06
11.	Results Seat Belt Survey 1981 07 17	81 07
12.	Results Seat Belt Survey 1981 08 21	81 08
13.	Results Seat Belt Survey 1981 09 22	81 09
14.	Results Seat Belt Survey 1981 10 23	81 10
15.	Results Seat Belt Survey 1981 11 20	81 11
16.	Results Seat Belt Survey 1982 03 29	82 03
17.	Results Seat Belt Survey 1982 06 18	82 06
18.	Evaluation of Dura-Brite Snowplowable Reflective Pavement Marker	82 09

POOR

QUALITY

ORIGINAL